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Trade Liberalization, Profitability, and Financial Leverage

by Jen Baggs and James A. Brander

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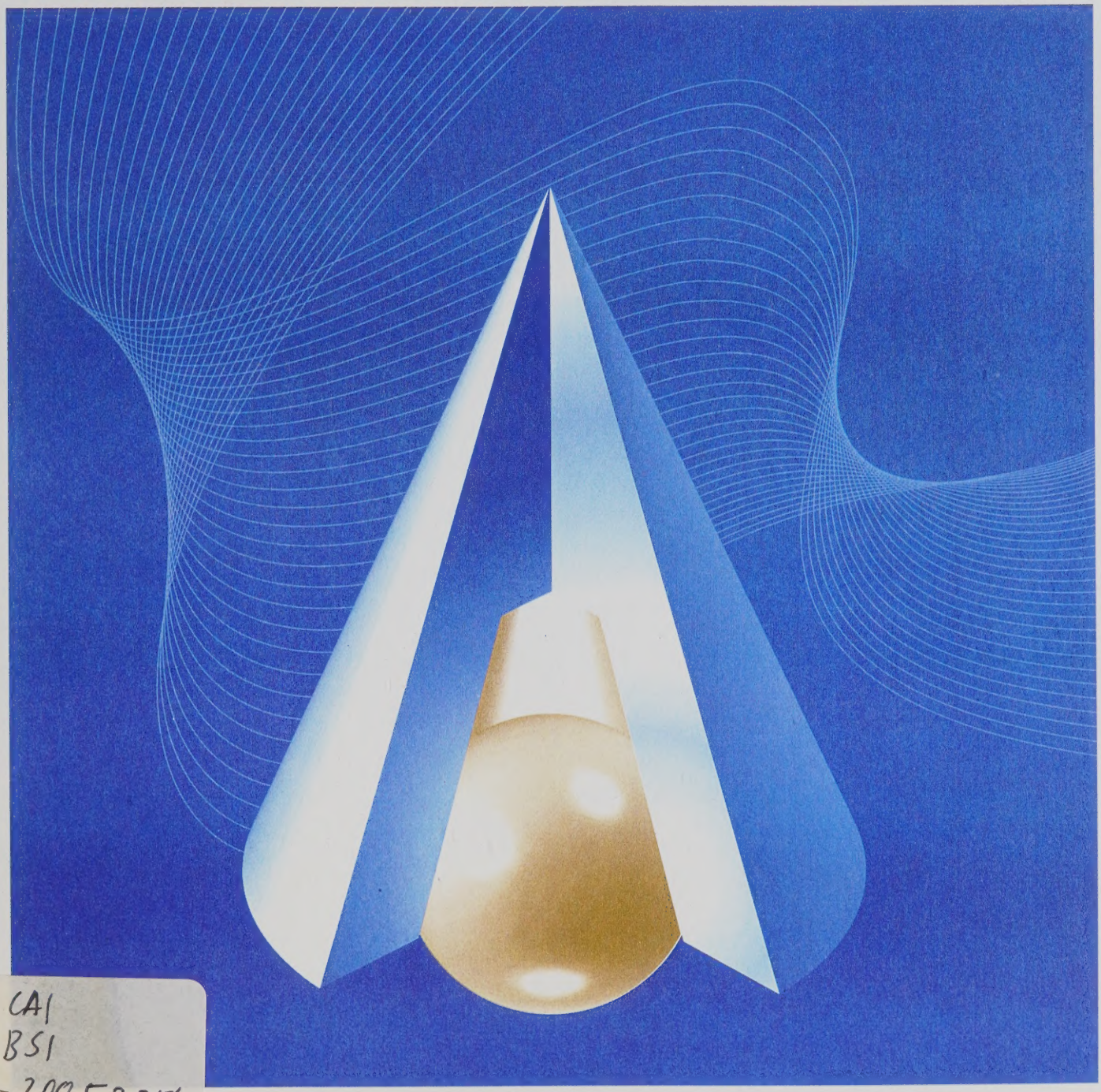

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Abstract

We investigate whether trade liberalization affects profitability and financial leverage, using Canadian data from the period following implementation of the Canada-U.S. Free Trade Agreement. We find that falling domestic tariffs are associated with declining profits and increasing leverage for import-competing firms, while falling foreign tariffs are associated with increasing profits and decreasing leverage for firms in export-oriented industries. This pattern is consistent with the "pecking order" theory of capital structure.

Keywords: International trade, Capital structure, Leverage, NAFTA, Pecking order

1. Introduction

One of the fundamental questions of financial economics concerns the determination of financial leverage—the relative importance of debt as opposed to equity in financing the firm. This paper advances the hypothesis that changes in international trade policy might influence financial leverage. In the increasingly open and interdependent world economy any such influence is likely to be of increasing importance.

Our primary objective is to investigate empirically whether trade liberalization has an impact on leverage. A second objective is to estimate the effect of trade liberalization on profitability. The profitability question is important in its own right as changes in trade policy are a major part of the international business environment for many firms. In addition, our theoretical formulation suggests that trade liberalization influences leverage largely through its effect on profits. Therefore, testing the link between liberalization and profits is a central test of our overall theoretical structure.

Admittedly, we might expect trade liberalization to have only a modest effect on leverage relative to other determinants. If so, the liberalization effect might be difficult to observe. However, we are fortunate in having access to a unique data set constructed by Statistics Canada that tracks the profits and financial leverage of Canadian firms in the period immediately before and subsequent to the 1989 implementation of the Canada-U.S. Free Trade Agreement (FTA).[1] In view of the importance of the U.S. economy to Canadian firms and given the significance of the FTA trade liberalization, there is a reasonable hope that the effects on leverage in this case might be large enough to observe.

Adopting the debt to asset ratio as our measure of leverage, we use the leading theories of capital structure to develop a variety of hypotheses regarding the impact of trade liberalization. The nature of this predicted impact differs according to the theory of capital structure under consideration. Our empirical results can therefore be used to draw inferences regarding the relative importance of the major theories of capital structure. We focus in particular on the "static trade-off" theory of capital structure and on the "pecking order" theory. We also discuss the "market timing" or "window of opportunity" approach to capital structure.

We find that lower Canadian tariffs tend to reduce the profits of Canadian firms, especially for the firms most subject to competition from imports. Correspondingly, lower U.S. tariffs tend to increase profits, especially for the most export-oriented Canadian firms. We also find that profits have a negative effect on leverage, indicating that higher profits lead to less dependence on debt. Correspondingly, the overall effect of trade liberalization is that lower Canadian tariffs are associated with higher leverage for Canadian firms, whereas lower U.S. tariffs are associated with reduced leverage for Canadian firms. Another way of looking at this result is that import-competing firms tend to experience an increase in leverage arising from trade liberalization while firms in export-oriented industries tend to experience a decrease in leverage. This combination of results offers support for the pecking order approach to capital structure.

1. The Canada–U.S. Free Trade Agreement was later extended to include Mexico, becoming the North American Free Trade Agreement (NAFTA) as of January 1, 1994.

We also discuss the implications of our results for managerial decision-making and for public policy. At the managerial level we suggest that it is important for firms to adjust financial decisions to changes in the trade policy environment. As far as public policy is concerned, our results suggest that trade liberalization has under-appreciated effects that should be considered in trade negotiations and in policy design. While our study looks only at the direct effect of trade liberalization on the leverage and profits of firms, the public policy implications of our results would be amplified by the unambiguous benefits to consumers from trade liberalization.

The next section provides a brief literature review. Section 3 describes the major theories of capital structure and develops testable hypotheses regarding the possible effect of trade liberalization on profits and financial leverage. Section 4 provides a description of the data set and Section 5 contains the empirical results. Section 6 describes managerial and policy implications of our findings and Section 7 is devoted to concluding remarks. An appendix contains further information about the data.

2. *Literature review*

This paper suggests that trade policy changes lead to changes in the product market environment that in turn give rise to changes in profitability and financial leverage. The idea that profits and leverage are related to the firm's product market environment is well established. Early papers on this topic, including Allen (1990), Brander and Lewis (1986), and Titman (1984), emphasize the effect of leverage on product markets. Later papers dealing primarily with the reciprocal influence, from product markets to financial leverage, include Maksimovic and Zechner (1991), Kovenock and Phillips (1995), and McKay and Phillips (2001).

There is also a substantial literature on the effect of trade liberalization on firm-level outcomes. In particular, papers by Baggs (2004), Pavcnik (2002), Gu, Sawchuck and Rennison (2003), and Lewis-Bynoe, Griffith and Moore (2002) investigate the effect of trade liberalization on exit. There is also a set of papers dealing with the effects of the Canada-U.S. Free Trade Agreement on employment and firm size, particularly Beaulieu (2000), Gaston and Trefler (1997), Head and Ries (1999) and Trefler (2004). However, only two of these papers, Head and Ries (1999) and Trefler (2004), use firm level data, and in both cases small firms are absent from the analysis. We are not aware of any work dealing explicitly with the effect of trade liberalization on financial leverage. Perhaps the closest paper is Bris, Koskinen, and Nilsson (2003), which focuses on the effect of a change in the exchange rate regime (adoption of the Euro) on firm valuation.

Our paper also draws on the theory of capital structure. Determination of the firm's appropriate mix of debt and equity is one of the longest-standing topics in finance. In a surprising paper, Miller and Modigliani (1958) established that under certain conditions there is no unique optimum for financial leverage. This result, referred to the Modigliani-Miller (MM) theorem, assumes "perfect markets" and runs counter to the common sense idea that capital structure seems very important in practice. Accordingly, there has been much subsequent analysis seeking to relax assumptions underlying the (MM) theorem.

The first significant departure from the MM theorem focused on the idea that using debt has an associated tax advantage but also increases the risk of bankruptcy. Maximization of firm value

implies a trade-off between the tax advantages of debt and expected bankruptcy costs leading (normally) to a unique internal optimum for the debt-equity (or debt-asset) ratio. This is the "static trade-off" theory of capital structure as set out, for example, in Kraus and Litzenberger (1973).

The "pecking order" theory is an alternative to the MM approach that goes back at least as far as Donaldson (1961). The modern interpretation of this theory is due to Myers (1984) and Myers and Majluf (1984), who suggest a version based on market imperfections in the form of informational asymmetries. Under this theory, firms prefer to use retained earnings if possible, turn to debt if retained earnings are not sufficient, and use new outside equity only as a last resort.

In recent years a third theory of capital structure, the "market timing" or "window of opportunity" theory, has become influential. The first complete statement of this theory is normally attributed to Baker and Wurgler (2002: 3) who state the following: "In our opinion ... capital structure is the cumulative outcome of attempts to time the equity market." This theory is based on previous empirical work, particularly Ritter (1991), Ikenberry et. al. (1995), and Bayless and Chaplinsky (1996). These papers can be interpreted as suggesting that firms issue equity when it is a relatively inexpensive source of capital and tend to repurchase equity and/or avoid issuing new equity when equity is an expensive source of finance.

3. *Hypothesis development*

Our first hypothesis concerns the effect of trade liberalization on profits. Import tariff reductions should put downward pressure on profits of import-competing firms as they experience more vigorous competition from foreign rivals facing lower tariffs. Conversely, firms in export-oriented industries should tend to benefit from trade liberalization, as they experience lower export tariffs and better access to foreign markets. Overall, we should observe that firm profits are negatively affected by import tariff reductions while profits are positively affected by export tariff reductions. The extent of these effects should depend on the firm's exposure to import competition and on its export orientation, as expressed in Hypothesis 1.

Hypothesis 1: The profit hypothesis

i) Reductions in import tariffs tend to reduce profits, especially for firms most subject to import competition.
ii) Reductions in export tariffs tend to increase profits, especially for firms most strongly oriented toward exports.

The next two hypotheses deal with the effect of trade liberalization on financial leverage. We first consider the implications of the static trade-off theory of capital structure. Interest payments on debt are fully tax-deductible while earnings used to pay dividends or that underlie capital gains are not. This tax advantage favors using debt rather than equity. However, given uncertainty in cash flows, increasing use of debt makes bankruptcy more likely and, assuming bankruptcy has costs, increases the expected value of such costs.

Our theoretical innovation is to note, given Hypothesis 1, that falling domestic tariffs should tend to lower profits and increase the probability of bankruptcy without significantly affecting the tax

advantages of debt. Correspondingly, the firm's optimal level of leverage falls. In effect, the firm finds it desirable to partially offset increased bankruptcy risk by reducing leverage. This effect will be strongest for firms most vulnerable to import competition. Conversely, increased access to the foreign market caused by declining foreign tariffs will tend to increase profit and decrease the probability of bankruptcy without affecting the tax shield effect and will therefore increase optimal leverage. This effect is strongest for firms most strongly oriented toward exports. These inferences are expressed as Hypothesis 2. A formal mathematical derivation is available in Baggs and Brander (2003).

Hypothesis 2: The trade-off hypothesis

(i) Reductions in profit tend to reduce optimal leverage.
(ii) Increases in profit tend to increase optimal leverage.
(iii) Reductions in domestic tariffs tend to decrease the firm's optimal leverage, especially for firms most subject to import competition.
(iv) Reductions in foreign tariffs tend to increase the firm's optimal leverage, especially for firms in highly export-oriented industries.

The pecking order approach to capital structure is based on informational asymmetries. Senior managers are assumed to have better information about the firm than outside investors, leading to "adverse selection" problems of the type first analyzed by Akerlof (1970). Firms with good prospects would have difficulty distinguishing themselves from lower quality firms. Poor firms would then dominate the supply of new equity offerings and investors would regard equity issues as a negative signal. A good firm raising equity would have to offer a discount in the price of equity. In addition, there is also a "hidden action" or agency problem in that outside investors cannot observe and/or legally verify relevant managerial actions. Managers then have incentives to take actions that benefit themselves at the expense of the outside investors. This effect also leads to discounts in the price of new equity. These agency costs are likely to be less severe (but still present) with privately held firms than with public firms.

Debt involves a fixed payment that is senior to equity returns. Return to creditors are therefore more secure and less subject to information problems than returns to equity holders. However, there is some possibility of debts not being repaid. The likelihood and magnitude of any such shortfall depend on the underlying prospects of the firm and on the performance of management which are, as before, subject to information asymmetry. Therefore, raising funds through debt involves a lower but still positive "penalty" to the firm relative to the actuarially fair value of the assets. While the consequences of asymmetric information are not as severe in the case of debt as with equity, they are still present and will impose an information-based penalty on debt financing.

Financing activities with retained earnings does not involve any information-based financial penalty, as no new financial capital is sought from uninformed parties. Accordingly, firms have a pecking order for sources of finance: retained earnings are preferred, debt is next in line, and new equity is used only as a last resort. Myers (1984) suggests that the costs of issuing equity or risky debt normally far outweigh the tax advantages of debt considered in the trade-off model. Accordingly, he suggests that leverage will be determined primarily by the pecking order. For our

purposes the important point is that increased profits allow increased use of retained earnings. When profits and retained earnings fall, firms use more debt finance and therefore increase their leverage.

The implications of trade liberalization follow readily. When domestic tariffs fall, competition from imports becomes more intense. This lowers profitability for import-competing firms and reduces their ability to use retained earnings to finance their activities. The firm would turn primarily to increased debt finance and would increase its leverage.

Conversely, lower foreign tariffs act to increase access for domestic firms in the foreign market and therefore tend to increase profits. The firm would have more internal funds available and would be able to reduce its reliance on debt. Therefore, falling foreign tariffs will act to reduce the leverage of domestic firms, as expressed in Hypothesis 3.

Hypothesis 3: The pecking order hypothesis

(i) Reductions in profit are associated with increases in leverage.
(ii) Increases in profit are associated with decreases in leverage.
(iii) Reductions in domestic tariffs tend to increase the firm's leverage, especially for firms most subject to competition from imports.
(iv) Reductions in foreign tariffs tend to decrease the firm's leverage, especially for firms in the most export-oriented industries.

Now consider the market timing approach, which is based on the relative price of the firm's equity. Under the market timing theory, as with the pecking order theory, the firm's capital structure is path-dependent: it simply emerges as the result of a sequence of incremental decisions. In this case, those decisions relate to trying to "time the market" or to seek "windows of opportunity" for either issuing or repurchasing equity.

The market timing principle therefore suggests that firms will shift leverage in favour of debt when debt is "cheap" relative to equity, and will shift in the direction of equity when equity finance is "cheap" relative to debt. In our data set, which contains only book values of debt, equity, and assets rather than market values, we have no way of directly addressing the market timing theory using the firm's own costs of debt and equity. The only information we have on the relative cost of different types of finance is market interest rates. The market timing insight suggests that debt is likely to increase when its cost is relatively low (i.e., when interest rates are low) and is likely to decrease when interest rates are high. Our firm-level data is annual and therefore we can check only annual responsiveness to interest rates, but this does allow some possibility for drawing inferences about the market timing approach as expressed in Hypothesis 4.

Hypothesis 4: Market timing of debt

Increases in interest rates tend to decrease leverage.

In addition, it is possible that a negative shock to retained earnings makes it more difficult for the firm to sell equity than when retained earnings are high. If so, debt will be a more attractive source of finance when retained earnings are low than when they are high. Under this reasoning, the market

timing approach would also be consistent with Hypothesis 3. Neither Hypothesis 3 nor Hypothesis 4 is a direct test of market timing and we acknowledge that distinguishing between market timing and the pecking order approach is difficult with the data we have available. However, our results do provide some information.

4. Data description

We use a dataset created by Statistics Canada and referred to as the T2-LEAP dataset or simply "T2-LEAP". It was created by linking two underlying sources of data: corporate tax information from "T2" tax forms, and the Longitudinal Employment Analysis Project (LEAP), which obtains its data from firm-specific payroll information filed with the Canada Revenue Agency (CRA). Firm names are removed and replaced with numerical identifiers so as to make the data set anonymous.

T2-LEAP is a longitudinal dataset that provides information on every incorporated Canadian establishment[2] that legally hires employees (and hence files payroll information with the CRA) AND, in the same year, files a "T2" corporate income tax return. T2-LEAP covers the period 1984 through 1997, we use data from the post FTA period, 1989-1997. It provides annual firm-level data documenting the firm's employment level, profit, revenues, debt, equity, assets, location, and industry affiliation at the 3-digit Standard Industrial Classification-Establishment (SIC-E) level. The dataset contains almost the entire Canadian private sector as measured by either output or employment. Components of the economy that are omitted include non-incorporated enterprises and corporations that hired no employees. Several filters are applied in order to "clean" the data as described in the appendix.

One advantage of the data is that it includes both publicly traded firms and (the more numerous) privately held firms. The results obtainable from this data set are an important complement to empirical analysis based on just publicly traded corporations. However, we are restricted to book values of debt, equity, and assets. As noted above, the data are annual. All financial data are converted to real (1986) Canadian dollars using the Consumer Price Index (CPI).

In order to estimate the effect of tariff changes on profits and leverage we must link T2-LEAP to tariff data. Canadian and U.S. tariffs can be translated, following Head and Ries (1999), to 3-digit SIC codes for manufacturing firms. As this is possible only for manufacturing firms, we are forced to restrict attention to the manufacturing sector. Each firm will, for each year, be associated with the import and export tariff for its 3-digit SIC code. Most firms are confined to a single 3-digit industry. However, some span more than one 3-digit industry in which case Statistics Canada selects the most important 3-digit code for that establishment.

Our data set has over 284,000 observations and over 53,000 firms. A significant subset of the firms do not report profits. This arises because firms that do not earn positive accounting profits are not required to report profits. Their profits are coded as zero although most such firms in fact have negative accounting profits.

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2. An "establishment" is not necessarily equivalent to a "firm" as some large firms have more than one establishment, but the overwhelming majority of firms are single establishments and, correspondingly, the vast majority of establishments correspond to independent firms. We will use the term "firm" to represent the units in the data set from now on.

New equity offerings and new bond issues are relatively infrequent occurrences, but changes in bank debt and other liabilities are frequent. Thus leverage changes virtually every year for virtually every firm. Table 1 reports descriptive statistics regarding profit and leverage.

Table 1: Descriptive statistics regarding profit and leverage

	All firms		Profitable firms	
Number of firms	53,389	53,389	45,607	45,607
Number of observations	284,517	284,517	186,183	186,183
	Profits (000s)	**Leverage (debt/assets)**	**Profits (000s)**	**Leverage (debt/assets)**
25th percentile	30.9	0.41	63.4	0.42
Median	124.3	0.65	168.6	0.65
Mean	990.0	0.66	1155.4	0.66
75th percentile	388.3	0.88	473.5	0.86
99th percentile	12,227	1.71	14,304	1.70

Average leverage in our data is about 0.66, implying that the average firm has about 66% of its assets represented by debt and about 34% represented by equity. Median leverage is 0.65, just slightly less than the average. Median leverage rose from .63 to .68 over the 1989-1993 period then fell to .65 as of 1997. Leverage is not highly skewed. Some firms (about 10%) report debts that exceed assets, implying that equity is negative for these firms. This normally arises because the book value of assets does not capture their full economic value. However firms might sometimes have genuine negative equity. This would, for example, often be true of firms operating under bankruptcy protection.

The explanatory variables of central interest are tariff changes (or changes in tariffs). Table 2 offers some summary information. Under the FTA some tariffs fell to zero as of 1989, some fell to zero over five years (1989-93) and the remaining tariffs fell to zero over ten years (1989-98). This implies, as shown by the table, that not all tariffs had fallen to zero of as 1997, as the 10th and final adjustment remained for some industries.

Table 2: Descriptive information regarding tariffs (in percentage points)

	Canada 1989	U.S. 1989	Canada 1993	U.S. 1993	Canada 1997	U.S. 1997
Largest tariff	18.3	18.6	10.1	10.4	2.0	2.1
Average tariff	6.0	2.7	2.4	1.1	0.4	0.2
Median tariff	5.4	2.3	2.2	0.9	0.3	0.1
Smallest tariff	0.0	0.0	0.0	0.0	0.0	0.0

One important issue concerns the collinearity between U.S. and Canadian tariff changes. Our analysis requires that we distinguish between decreases in Canadian and U.S. tariffs. If every Canadian tariff reduction on a good were matched by an equal U.S. tariff reduction on that good, the correlation would be 1.0 and it would be impossible to separately identify the effect of U.S. and Canadian tariff changes. However, the initial tariff structures had significant differences, implying that tariffs reductions were not collinear. The correlation between export and import tariff

reductions in our data is 0.82. While this correlation is large and positive it allows enough independent variation to estimate the distinct effects and U.S. and Canadian tariffs. Table 3 reports descriptive statistics on firm-and industry-specific variables used as control variables.

Table 3: Descriptive statistics regarding control variables (all observations)

	Assets (000s)	Employees	Age	Import intensity	Export intensity
25th percentile	129	4.0	6	.08	.07
Median	378	9.9	8	.20	.17
Mean	9,512	54.1		.24	.25
75th percentile	1,187	25.7	11	.38	.40
99th percentile	85,183	671.1		.71	.92

Import intensity shows the share of U.S. imports in total sales for a given 3-digit industry for a given province. Export intensity variable shows the share of the output in a given 3-digit industry and province that was exported to the United States. These trade intensity variables should be good measures of exposure to import competition and to export orientation respectively.

As expected, variables related to firm size are highly skewed. The median firm has assets of only about $378,000 (Cdn.) whereas the mean level of assets is an order of magnitude larger at over $9 million (Cdn.). Employment levels are in standardized units that are adjusted to appropriately reflect the mix of full-time and part-time employment in each firm. Employment is strongly skewed with the average of 54 employees exceeding the median of about 10 employees by a factor of 5. The age variable shows the number of full calendar years a firm is in the data up to and including the current observation. As LEAP data program started in 1984, firms that existed prior to 1984 have their age "top-coded" as if they started in 1984. Accordingly we do not report the mean or 99th percentile for age and we use age only to identify new and young firms.

Some variables that might be used as explanatory variables for leverage, such as R&D expenditures, market to book value (Tobin's Q), and dividends are not available to us. These omitted variables must be viewed as entering the error terms in our regressions. If these omitted variables were correlated with tariffs, then our estimates would be susceptible to omitted variable bias. While the possibility of such bias can never be completely ruled out, we have no reason to expect such bias to be important in this case.

Table 4: Interest rates and exchange rates

Year	Prime rate	Exchange rate		Year	Prime rate	Exchange rate
1987	0.095	0.754		**1993**	0.059	0.775
1988	0.108	0.812		**1994**	0.069	0.732
1989	0.133	0.845		**1995**	0.086	0.729
1990	0.141	0.857		**1996**	0.061	0.733
1991	0.099	0.873		**1997**	0.050	0.722
1992	0.073	0.827		**1998**	0.066	0.674

In addition to firm-specific variables there might also be macroeconomic variables that affect profits or leverage. We have reported results regarding two such variables: the exchange rate and interest rates (represented by the Canadian prime rate). For each of these variables we have one economy-wide observation for each year. The prime rate and the exchange rate are expressed as fractions. Thus an interest rate of 0.095 can be read as 9.5% and an exchange rate of 0.754 means that it cost US$0.754 to purchase one Canadian dollar. Interest rate and exchange rate data are shown in Table 4.

5. Empirical results and analysis

The effect of tariff changes on profits

Hypothesis 1 concerns the effect of tariff changes on profits. We test this hypothesis using a regression methodology. In view of the skewness of profits, it is natural to use the (natural) logarithm of profits as the dependent variable.[3] Changes in export tariffs and import tariffs are the primary explanatory variables. The regression equation has the following form.

$$\ln(\pi_{it}) = \alpha_0 + \alpha_1 \Delta \tau_{it} + \alpha_2 \Delta \tau_{it}^* + \alpha_c C_{it} + \varepsilon_{it} \qquad (1)$$

where π represents profit, τ represents the import tariff, τ^* represents the export tariff, C represents a vector of control variables and ε is a random error. The subscripts i and t refer to the ith firm at time t. The change in tariffs is the change between the last period and the current period. Thus a tariff reduction appears as a positive $\Delta\tau$. As for control variables, firm size can be controlled for using the log of assets (a rough measure of capital) and the log of employment (a good measure of labour) as explanatory variables. We also include industry fixed effects at the 2-digit SIC level,[4] and a time trend. We capture the effect of firm age by including fixed effects for "new" firms (those firms in their first eligible year) and "young" firms (those in their 2nd or 3rd eligible years). We also control for the exchange rate.

In considering Hypothesis 1, it is important to identify which firms are most likely to be affected by import tariff changes and by export tariff changes. This is achieved by using the trade intensity variables and related interaction effects. Specifically, we allow for an interaction term between import tariff changes and import intensity and we allow for a second interaction term involving export tariff changes and export intensity. The coefficients on these interaction terms then reflect whether tariff effects increase (as predicted) as the extent of import competition and/or export orientation rise.

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3. We use the log of (profits + 1) so as to bound the argument of the log function strictly away from 0. This is desirable given that the log of 0 is not defined. Using the log of profits (i.e., without adding 1) has no significant effect on the results but, in our view, is conceptually flawed.

4. Tariffs vary by industry at the 3-digit SIC level. Therefore, it is not possible to use industry fixed effects at the 3-digit level. Furthermore, we would expect industry fixed effects to operate at a higher level of aggregation than the 3-digit level in any case. We use industry fixed effects at the 2-digit SIC level. There are twenty-two 2-digit industries in the data and 121 3-digit industries. For example, one 2-digit industry is "Transportation Equipment" and it is subdivided into eight 3-digit industries, including aircraft, motor vehicles, motor vehicle parts, truck and bus body parts, railroad rolling stock, shipbuilding, boat building, and other.

The error term incorporates unobserved influences on profit. Unobserved idiosyncratic influences will certainly be more important than changes in tariffs in determining the profit of any firm. However, these effects should, in general, be uncorrelated with tariff changes. We therefore have a good chance to detect and isolate the effects of tariff changes on profit and leverage.

As can be inferred from Table 1, almost 100,000 of the approximately 285,000 observations have non-positive profits. These non-positive profits are all coded as 0, giving rise to a censoring problem of the limited dependent variable type. This is handled using a Tobit estimation procedure as described, for example, in Wooldridge (2002), which allows us to use all of the observations. All regressions use the Huber/White/sandwich method as implemented by STATA to correct for heteroskedasticity and for clustering within 3-digit industries.

The results shown in Table 5 are very consistent with Hypothesis 1. Specification 1 (column 2) shows the crude effect of changes in tariffs on profits, without controlling for various other influences. The tariff effects come through strongly even in this form. Specification 2 provides results incorporating the vector of relevant control variables, but not including import and export intensity effects. The control variables come through strongly with expected signs and reasonable magnitudes.

The variables that correct for size—employment and assets—can be viewed as measures of the labor and capital inputs respectively. If the dependent variable were viewed as a rough proxy for output, we would be estimating a production function and the sum of the coefficients on labour and capital would be the estimate of local returns to scale. While we do not want to read too much into these coefficients, we take it as reassuring that their sum is not far from 1. The fact that both assets and labour are highly and independently significant suggests that this is the best way to control for size—better than simply dividing profits by either assets or employment.

Table 5: Effect of tariff changes on profits

Dependent variable = ln(profits + 1); standard errors are in parentheses

Specification Regressors	1 Tobit	2 Tobit	3 Tobit	4 Tobit	5 OLS
# observations	284,517	284,517	284,517	284,517	186,183
intercept	4.30 *** (.008)	9.32 *** (.16)	9.44 *** (.16)	9.37 *** (.16)	4.30 *** (.11)
Δimport tariff	-14.6 *** (1.6)	-28.6 *** (1.8)	-24.5 *** (1.9)	-35.8 *** (2.2)	-2.68 * (1.5)
Δexport tariff	26.6 *** (2.9)	6.76 * (3.6)	6.25 * (3.6)	6.99 (4.46)	17.0 *** (2.8)
ln(employment)		.417 ** (.005)	.42 ** (.005)	.415 ** (.005)	.385 ** (.003)
ln(assets)		.418 ** (.005)	.42 ** (.005)	.421 ** (.005)	.453 ** (.003)
exchange rate		-10.3 *** (.18)	-10.4 *** (.18)	-10.4 *** (.18)	-3.41 *** (.13)
time trend		-.053 ** (.004)	-.047 ** (.004)	-.046 ** (.004)	.001 (.003)
new firm		-.174 ** (.018)	-.171 ** (.018)	-.173 ** (.018)	.104 ** (.010)
young firm		-.099 ** (.014)	-.097 ** (.014)	-.099 ** (.014)	.108 ** (.008)
import intensity			-.285 ** (.037)	-.731 ** (.059)	-.265 ** (.031)
export intensity			.613 ** (.043)	.732 ** (.051)	.082 ** (.025)
import interaction				-42.8 *** (4.4)	-22.7 *** (2.6)
export interaction				16.3 * (9.2)	20.8 *** (6.1)
2 digit SIC industry fixed effects	NO	YES	YES	YES	YES
Log likelihood	-637187	-587766	-587655	-587600	R^2 = .78

***, **, * = significance at the .01 level, .05 level, and .10 level respectively

The exchange rate coefficient has a negative sign and is highly significant, indicating, as expected, that depreciation of the Canadian dollar is good for profits of Canadian firms (measured in Canadian dollars) and appreciation is bad for Canadian profits. The "new firm" effect indicates that, other things equal, new enterprises (i.e., enterprises in their first full year as corporations) have lower profits than more experienced firms. Young firms (those in their 2nd and 3rd years) also suffer a profit discount, but that discount is of considerably smaller magnitude than for new firms.

The primary effects of interest, the tariff effects, are changed by the introduction of control variables. The import effect becomes larger and increases in statistical significance, while the export

tariff effect declines in size and in statistical significance, although this effect remains statistically different from 0 at the .10 level of significance.

Specification 3 introduces import and export intensity variables. The import intensity variable is negative and highly significant, indicating that, other things equal, firms in more vigorous competition with imports from the United States had lower profits than other firms. Conversely, the export intensity variable is positive and significant, indicating that firms that were export oriented did better than other firms, other things equal. The coefficients on other variables are virtually unaffected by adding these trade intensity variables.

The specification of greatest interest is Specification 4, which reports interactions between tariff changes and trade intensities. The import interaction is the product of the import tariff change and the level of import intensity. The export interaction is the product of the export tariff change and the export intensity. If Hypothesis 1 is correct, then the negative effect of import tariff reductions on profit should be strongest for firms with high import intensity, leading to a negative coefficient on the import interaction. Similarly, the export interaction term should have a positive coefficient. If the effects of tariff changes are strongly concentrated at the most extreme levels of import competition and export orientation, it is even possible that the basic tariff change variable might lose its significance.

The coefficients on the interaction terms are consistent with Hypothesis 1 and the effects are statistically significant. The coefficient on the export tariff does not decline in nominal value, but it does move marginally outside the .10 significance level. Other coefficients retain (or increase) their statistical significance and are very stable as we move from Specification 3 to Specification 4.

In the final column we report one regression using ordinary least squares (adjusted for heteroskedasticity and clustering). This regression uses observations with positive profits only and is otherwise directly comparable to Specification 4. The qualitative pattern of the results is similar, but there are two noteworthy differences. First, import tariff effects are less important in relative terms and the export effects more important in relative terms among the subset of firms that report positive profits. Second, when we look just at firms reporting positive profits, the new firm effect and the young firm effect are positive rather than negative. This implies that the negative effects of being young or new are concentrated among firms that do not have positive profits. This is interesting although not implausible. Our primary emphasis is on the Tobit regressions, especially Specification 4, as we believe it is preferable to explicitly handle the censored observations if possible rather than simply ignoring them. Both econometric approaches find results supportive of Hypothesis 1.

A large part of the variation in profits arises from the fact that, as some firms are simply more successful than others, we observe consistently higher profits for firm-specific reasons. If so, it is desirable to control for firm-specific differences in some way. The two standard possibilities are to use first differences or to exploit the panel structure of the data by introducing firm-specific fixed effects. In our case, using firm fixed effects is possible but not appropriate as we have over 53,000 firms in a highly unbalanced panel. See, for example, Wooldridge (2003: 468) for a discussion of this point. Even so, both fixed effect and random effect models give similar results to those reported here.

Table 6 reports regressions using the first difference of profits as the dependent variable. This is not strictly a first differenced version of equation 1, as we use tariff changes as explanatory variables in both regressions. We also use industry fixed effects, new firm and young firm indicators, and levels of import and export intensity in both regressions. We do of course take the first difference of employment, assets, and the exchange rate. We also drop the time trend, whose effect is picked up in the constant when annual profit changes are the dependent variable. We should view the first difference regressions as reflecting a slightly different (but no less plausible) specification than equation 1. In addition, when using first differences we cannot legitimately use the observations for which profits are non-positive. Accordingly, our data set consists of approximately 186,000 observations and can be estimated using least squares.

Table 6: Effect of tariff changes on profit changes

Dependent variable = Δln(profits + 1); standard errors are in parentheses; OLS regressions

Specification Regressors	1	2	3	4
# observations	186,183	186,183	186,183	186,183
intercept	0.198 *** (0.004)	0.006 (0.12)	-0.003 (0.013)	-0.014 (0.015)
Δimport tariff	-1.56 (1.2)	-5.68 *** (1.6)	-6.68 *** (1.6)	-4.95 ** (2.0)
Δexport tariff	2.47 (2.1)	15.1 * (3.0)	15.1 *** (3.1)	24.2 *** (3.8)
Δln(employment)		0.121 *** (0.008)	0.121 *** (0.008)	0.121 *** (0.008)
Δln(assets)		.743 *** (0.008)	0.743 *** (0.008)	0.743 *** (0.008)
Δexchange rate		- 3.47 *** (0.15)	-3.49 *** (0.15)	-3.50 *** (0.18)
new firm		.121 *** (0.014)	.121 *** (0.014)	.121 *** (0.014)
young firm		.014 (0.012)	.012 (0.014)	.012 (0.014)
import intensity			-0.057 ** (0.023)	-0.124 *** (0.042)
export intensity			0.077 *** (0.029)	0.144 *** (0.034)
import interaction				-6.50 ** (3.5)
export interaction				34.1 *** (8.3)
2 digit fixed effects	NO	YES	YES	YES
adjusted R^2	0.00	0.09	0.09	0.09

***, **, and * = significance at .01 level, .05 level and .10 level, respectively.

The regression results reported in Table 6 lead to very similar qualitative conclusions as the results in Table 5. Specifically, the regression results in Table 6 are consistent with Hypothesis 1. Declining import tariffs tend to reduce profits, particularly for firms facing substantial import competition, while declining export tariffs tend to raise profits, especially for firms with high export intensity.

The effect of tariff changes on leverage

Hypotheses 2 and 3 require using leverage as the dependent variable. The basic regression structure links leverage, as measured by the debt to asset ratio, to changes in tariffs. There are two reasonable ways to address this linkage. The direct method is to regress leverage on tariff changes and

appropriate control variables. Alternatively, we can use a two-stage approach in which the first stage consists of regressing profit on tariffs and other variables and the second stage consists of regressing leverage on fitted or predicted values of profits. We report results using both methods. The direct method involves the following regression specification.

$$Lev_{it} = \beta_0 + \beta_1 \Delta \tau_{it} + \beta_2 \Delta \tau_{it}^* + \beta_c C_{it} + u_{it} \quad (2)$$

where C is a vector of control variables, including industry fixed effects, a possible time trend, whether the firm is new, young or experienced, and the exchange rate, as with the profit regression. We can use import and export intensities and interactions with tariffs to address the various parts of Hypotheses 2 and 3. In addition we use interest rates, as represented by the Canadian prime rate, to address Hypothesis 4. It is likely that using tariff changes lagged by one year is preferable to using current profits. Therefore, we report results using lagged tariff changes as regressors. This makes very little difference as tariff changes from one year to the next for a given firm are closely correlated. Table 7 provides a set of regression results showing the relationship between leverage and tariffs.

We also report the results of replacing the tariff change variables with fitted profits. This is part of a two-stage regression in which we first regress profits on tariff changes, employment, assets, two-industry fixed effects, new firm and young firm fixed effects, and the exchange rate. We then use lagged fitted profits as an explanatory variable for leverage. We also include industry fixed effects, the exchange rate and new firm and young firm fixed effects on the grounds that these variables might affect leverage through other channels than through profits.

Table 7: Effect of tariff changes on leverage

Dependent variable = leverage (debt/assets); standard errors are in parentheses

Specification Regressors	1	2	3	4	5
# observations	186,183	186,183	186,183	186,183	186,183
intercept	0.658 *** (0.002)	1.08 *** (0.05)	1.03 *** (0.051)	1.00 *** (0.051)	0.946 (0.031)
fitted ln(profit)					-0.038 *** (0.001)
Δimport tariff	3.22 *** (0.35)	3.80 *** (0.48)	3.02 *** (0.48)	5.04 *** (0.60)	
Δexport tariff	-5.26 *** (0.63)	-2.70 *** (0.92)	-2.92 *** (0.92)	-2.49 ** (1.2)	
exchange rate		-0.597 *** (0.057)	-0.296 *** (0.058)	-0.281 *** (0.058)	-0.092 ** (0.046)
interest rate		-0.180 * (0.096)	-0.027 (0.096)	-0.032 (0.096)	0.056 (0.071)
time trend		-0.001 (.-001)	-0.002 (.001)	-0.002 (.001)	
new firm		0.227 *** (0.005)	0.209 *** (0.005)	0.208 *** (0.005)	0.190 *** (0.005)
young firm		0.175 *** (0.003)	0.161 *** (0.003)	0.161 *** (0.003)	0.150 *** (0.003)
ln(profit)			-0.024 *** (0.001)	-0.024 *** (0.001)	
import intensity				0.081 *** (0.014)	-0.018 * (0.010)
export intensity				-0.028 ** (0.011)	0.015 ** (0.007)
import interaction				6.90 *** (1.2)	
export interaction				-0.427 (2.5)	
industry fixed effects	NO	YES	YES	YES	YES
adjusted R^2	0.00	0.05	0.06	0.06	0.07

***, **, and * = significance at .01, .05, and .10 levels, resp.; tariff changes, fitted profits and trade intensities are lagged one period

As we use profits as a regressor in Table 7, we use only those observations for which profits are positive. We have also run but not reported the regressions using all data, setting profits to zero for

the cases where profits are non-positive, and including a fixed effect for those observations. This produces very similar results to Table 7.

The primary fact arising from Table 7 is clear. Leverage appears to be related to changes in tariffs. Specifically, reductions in import tariffs tend to increase leverage and reductions in export tariffs tend to reduce leverage, although the export effect loses its statistical significance in Specification 4. This pattern of leverage responses to tariff changes is consistent with Hypothesis 3 (the pecking order hypothesis) and not with Hypothesis 2 (the static trade-off hypothesis).

Exchange rate appreciation has a negative effect on leverage. This is a surprise. Exchange rate appreciation tends to decrease profits (as shown in Tables 5 and 6), and Hypothesis 3 suggests decreased profits should increase leverage. We observe the opposite sign. We interpret this as reflecting an independent and important effect of exchange rate changes on firm balance sheets. Specifically, many Canadian firms carry debts denominated in U.S. dollars. When the Canadian dollar rises in value, the value of the American dollar debts falls and the debt to asset ratio (i.e., leverage) falls. As expected, new firms tend to have higher leverage that other firms, and young firms also tend to have higher leverage, but not as high as new firms.

The trade intensity variables and the associated interaction terms are of central interest. These results are reported in Specification 4, which shows that firms with high levels of import competition tend to have higher leverage than other firms. Correspondingly, firms with high export orientation tend to have lower leverage than other firms. Furthermore, the interaction between import tariffs and import competition shows that firms with greater import competition tend to have a larger response of leverage to import tariff changes. The export tariff—export intensity interaction is not statistically significant at the .1 level, but it is negative, indicating that firms with high export orientation tended to reduce leverage more in response to export tariff reductions than other firms. Overall the trade intensity coefficients and the tariff coefficients tell a consistent story that supports the pecking order hypothesis.

The role of profits warrants some attention. A central aspect of our theoretical structure is that tariff changes affect leverage because of their effect on profits. Accordingly, when we include profits as a regressor we might expect the apparent significance of the tariff effects to fall. In fact, the size and significance of the export tariff effect does fall, although it remains statistically significant in Specification 3. The size and significance of the import tariff effect remains strong even when profits are included. Profits have a strong negative effect on leverage as is consistent with the pecking order hypothesis.

Finally, the role of interest rates offers some (admittedly rather weak) evidence regarding Hypothesis 4. Hypothesis 4 is based on the market timing theory of leverage (or capital structure), and reflects the idea that debt (and therefore leverage) might rise when debt is "cheap" in the sense that interest rates are low. However, the effects of interest rates are weak at best and tend to work in the opposite direction to that suggested by Hypothesis 4.

Alternative specifications

There are many variations and permutations of econometric method that might be used. One important possibility would be to use the change in leverage rather than the level of leverage as a the dependent variable. In Table 8 we report regressions explaining first differences in leverage using tariff changes and using the two-stage approach where, in the second stage, tariffs changes are replaced by predicted changes in profit.

Table 8: Effect of tariff changes on leverage changes

Dependent variable = Δleverage (debt/assets); standard errors are in parentheses

Specification Regressors	1	2	3
# observations	186,183	186,183	186,183
intercept	0.004 (0.003)	0.003 (0.003)	0.331 *** (0.015)
fitted ln(profit)			-0.053 *** (0.002)
Δimport tariff	1.12 *** (0.32)	1.29 *** (0.40)	
Δexport tariff	-2.05 *** (0.61)	-1.29 * (0.78)	
Δexchange rate	0.620 *** (0.04)	0.592 *** (0.04)	0.711 *** (0.036)
Δinterest rate	0.005 (0.04)	0.005 (0.04)	0.035 (0.041)
new firm	-0.033 *** (0.003)	-0.031 *** (0.003)	-0.076 *** (0.004)
young firm	-0.033 *** (0.002)	-0.033 *** (0.002)	-0.066 *** (0.003)
Δln(profit)		-0.009 *** (0.001)	
import intensity		0.011 (0.010)	0.013 *** (0.005)
export intensity		-0.008 (0.008)	-0.025 *** (0.006)
import interaction		0.712 (0.80)	
export interaction		-2.87 * (1.69)	
industry fixed effects	YES	YES	YES
adjusted R^2	0.01	0.01	0.01

***, **, and * = significance at .01, .05, and .10 levels, resp.; tariff changes, fitted profits and trade intensities are lagged one period

The regressions in Table 8 are consistent with those in Table 7, although the trade interaction effects are not as strong. Nevertheless, the overall pattern is clear. Falling import tariffs tend to increase leverage and falling export tariffs tend to reduce leverage. Actual profits have a very significant negative effect on leverage, as do predicted profits. As before, annual interest rate changes do not have a significant effect. One point of interest is that exchange rate changes have a positive effect. This is consistent with our prior expectations.

The regressions reported in Tables 7 and 8 do not use the log transformation of leverage. Using the log of leverage gives the same qualitative pattern and stronger statistical significance. However, we report the results for untransformed leverage on the grounds that there is no conceptual reason to use logs. In particular, leverage is not significantly skewed in our data.

Two referees pointed out that expectations might be important. Specifically, as of late 1988 when a) the final tariff reduction schedules were determined, and b) it became clear that the FTA was going forward, it was possible for firms and investors to calculate the implied tariff changes for the next 10 years. Annual tariff changes did not come as a "surprise" to the firms. Therefore, we expect that the market value of each firm's equity would respond quickly to these expected tariff changes.[5] If we were using market values of equity or assets this effect would be important. However, we do not use market values. We use the book value of debt and the book value of assets. These book values should evolve according to day-to-day changes in the firm's debt position. Therefore, anticipation of the tariff reduction schedules should not introduce estimation problems or interpretation problems in our analysis. We ran regressions with current tariff changes, tariff changes lagged by one year and tariff changes lagged by two years and obtained very similar results in each case.

There might also be some question as to whether each year for a given firm should be treated as a separate observation. Some firms had the same tariff reduction each year for 5 years (after which the tariff was eliminated) and some had the same reduction each year for 10 years. However, the other variables of interest were changing from year to year, as were tariffs themselves, so we would argue that year-to-year changes are legitimately distinct observations that should be included in any estimation. At the suggestion of a referee, we tried adding categorical variables indicating, for each observation, where the firm was in its tariff reduction schedule. We used separate indicators for firms in the first five years of a 10-year elimination schedule, in the second five years, in the first five years of a 5-year elimination schedule, etc. Incorporating these categorical effects has little effect on the coefficients of interest and the categorical effects themselves were significant in both profit and leverage regressions.

One referee made the point that tariffs (and hence tariff changes) might be endogenous, as political considerations in the pre-FTA period might have led to more protection (i.e., higher tariffs) for declining industries. If so, this would induce a possible correlation between the error term and the tariff change variable in our leverage regressions. Following Gaston and Trefler (1997), Beaulieu (2000) and Trefler (2004), we account for this possibility using the instrumental variables (IV) estimation method outlined in Gaston and Trefler (1997). Specifically, we regress 1988 tariff levels on 1984-87 import growth, employment growth, and sales growth. We apply a common phase-out

5. This is consistent with the empirical work of Brander (1991) and Thompson (1993) showing that expected and actual ratification of the FTA had a significant effect on stock market valuations of Canadian firms.

rule for all industries starting from the fitted values of tariffs. This produces predicted values for tariffs over the 1989-97 period. These predicted values are used as instruments (i.e., explanatory variables) in place of the actual tariffs. Using these instruments we get similar results to those already reported. If anything, the results offer slightly stronger support for Hypotheses 1 and 3. However, statistical tests indicate that while the instruments are valid, firm level endogeneity of tariff changes can be rejected at the .01 level. Accordingly, we do not report the IV results.

Economic significance

So far we have focused on the statistical significance of the results, reflecting our primary interest in the qualitative pattern of the results and the implications for our central hypotheses. Standard errors of estimates and variations across specifications are large enough that we would not attach great weight to specific point estimates of coefficients. Nevertheless, it is worth considering the economic significance (as implied by the magnitude of the coefficients) of our estimates. These magnitudes are of interest in themselves and the extent to which they are plausible provides an additional check on the overall analysis.

In Table 9 we report implied effects of tariff changes on profits and leverage using Specification 4 from Table 6 and Specification 2 from Table 8. These specifications are chosen because they are the most complete and most preferred explanatory regressions for the regressions that deal directly with differences in profit and leverage respectively. The table shows the effect of "large" and "average" changes in export and import tariffs. For example, the second column shows the effect of a large annual change in an import tariff. We assume the firm has average profit, average leverage, and average import intensity, but is not affected by exports. We calculate the implied effect on profit and leverage of a 2 percentage point (.02) change in the relevant import tariff for such a firm, holding other factors constant. Profits are measured in thousands of dollars. The corresponding calculations are carried out for a large export tariff, an average import tariff and an average export tariff in successive columns. The final column shows the effect on an average firm affected by both average import and export tariff changes.

Table 9: Economic significance

	Large import Δtariff	Large export Δtariff	Ave. import Δtariff	Ave. export Δtariff	Combined effect (avg.)
Δ imp. tariff	0.02		0.009		0.009
Δ exp. tariff		0.02		0.004	0.004
empl	54	54	54	54	54
initial profit	990	990	990	990	990
Δprofit	-146	985	-84	180	96
initial leverage	0.66	0.66	0.66	0.66	0.66
Δleverage	0.032	-0.074	0.016	-0.026	-0.01

The magnitudes indicated in Table 9 appear plausible. The implied profit effects of export changes are rather high, but a 95% confidence interval includes reasonable values. The effect of a large import tariff reduction reduces profit by $146,000 for an average firm. At this rate, many firms

protected by initially large tariffs would have had profits reduced to zero over the phase-in period. Many firms did in fact go out of business. The implied effects on leverage are plausibly modest but large enough to be of interest. Looking at just tariff-related effects, an average firm in our data set would have experienced a reduction in leverage on the order of .01 per year going from, for example, .66 to .65 over a one-year period and going from about .7 to about .6 over the implementation period. This holds other factors constant. Not surprisingly, other factors did change over time with the result that average leverage rose slightly over the period.

6. Concluding remarks

This paper focuses on drawing inferences about decisions made by financial managers rather than on providing a normative prescription for managers. Nevertheless, there are lessons of managerial interest. First, we provide evidence on the effects of trade liberalization on firm profitability. Our findings are consistent with the general perception that exporting firms benefit from falling export tariffs and import-competing firms are harmed by falling import tariffs. Perhaps the most noteworthy aspect of these finding is striking responsiveness of profits to changes in tariffs, particularly export tariffs. Thus our results emphasize the importance of export markets and importance of taking advantage of trade policy changes. We also find the less obvious result that the trade liberalization is, on balance, good for profits, as suggested by the last column of Table 9. Therefore our results are consistent with the general support of the business community for trade liberalization.

We draw attention to the idea that changes in trade policy might well induce a change in the appropriate financial structure in the firm. Our econometric estimates indicate that financial managers do, in fact, react to trade policy changes sufficiently for the effects to be observable. However, it is likely that many managers do not react effectively to such changes. Even among those who do react, many managers are "forced into" changing leverage by default as profits fall or rise rather than anticipating the effects and acting accordingly. It is quite possible that firms would do better by intentionally changing leverage at an early stage.

At the public policy level, the FTA (and NAFTA) experience has been extensively studied. Nevertheless we do have some points to add. As indicated by the last column in Table 9, the net effect of the FTA in Canada was to increase profits and reduce leverage. Increased profits suggest that gains from trade to enhanced export opportunities more than offset losses from increasing export competition. This of course looks only at the effect on firms and does not include the unambiguous benefits to consumers from trade liberalization. In addition, the reduced net leverage would have made the economy less susceptible to propagation of business contractions through bankruptcy. This point is certainly underappreciated if it is appreciated at all. Overall, while our analysis is not targeted at either professional managers or policy makers, we believe that our results should be of considerable interest for both those groups

This paper underscores the basic idea that profits, capital structure, and product market competition are closely interrelated. It is clear that changing the competitive structure of the output market might change the profitability of firms. In addition, such changes might also affect the level of financial leverage chosen by the firm. We focus in particular on the change in product market conditions

arising from trade liberalization. We ask whether trade liberalization has a significant impact on profits and on financial leverage.

We have the good fortune to have a compelling policy event at our disposal. This policy event was the Canada–U.S. Free Trade Agreement of 1989 that ushered in a 10-year period of successive tariff reductions culminating in the elimination of tariffs in the manufacturing sector for trade between these two countries. The trade liberalization was large, well publicized, and not subsumed in a larger package of macro-economic reforms. In addition, by focussing on Canadian manufacturing firms we exploit the fact that the Canadian manufacturing sector is closely integrated into the U.S. economy.

During our sample period, the manufacturing sector exported about 40% of its total production to the U.S. (rising, over the period, from about 30% to about 50%). In addition, about 35% of manufacturing output consumed in Canada was imported from the United States and also rose sharply over the period. In Canada, virtually every manufacturing firm is either export-oriented or import-competing, and many fall into both categories. Conveniently, however, there is substantial heterogeneity across firms in the relative importance of Canadian and U.S. tariff changes. Putting these facts together implies that the Canada–U.S. Free Trade Agreement offers an excellent opportunity to test the idea that trade liberalization might affect leverage—and to estimate the nature of this effect. This data also allows us a rare opportunity to separately identify the impact of import and export tariff changes.

We show that two simple and important theoretical models of financial structure suggest different effects of trade liberalization on leverage. The static trade-off theory is based on the idea that financial leverage is determined primarily by the trade-off between the tax benefits of debt and the costs of debt in increasing the likelihood of bankruptcy (and hence increasing expected bankruptcy costs). Trade liberalization has two distinct effects on this trade-off. Declining domestic tariffs imply an increase in competition and a consequent increase in the likelihood of bankruptcy. Such a change would tend to reduce the firm's choice of leverage. Conversely, a declining foreign tariff increases a domestic exporter's market access and therefore reduces the probability of bankruptcy. This effect should tend to increase the optimal leverage.

The second model, the pecking order model, is based on the idea that informational asymmetries between managers and investors induce, to a first approximation, a pecking order in sources of finance. Retained earnings, which have no "information cost" associated with them, are the preferred source of finance. Debt, which incurs some cost premium due to informational asymmetries, is next in line. Equity, which pays the largest asymmetric information penalty, is the least preferred source of finance. The pecking order model has contrasting predictions to the trade-off model regarding the effects of trade liberalization. Under the pecking order model, falling domestic tariffs tend to reduce profits of domestic import-competing firms and therefore reduce the availability of retained earnings. Accordingly, firms move further down their pecking order of financing methods, substituting debt for retained earnings. This increases their debt and their leverage. Conversely, declining foreign tariffs increase domestic profits and allow firms to move up their pecking order of preferences for financing, and reduce leverage by increasing their use of retained earnings. We also consider a third theory of capital structure, the "market timing" or

"window of opportunity" theory. This theory is based on the idea that firms seek equity financing when equity is relatively "cheap" and seek debt financing when debt is relatively inexpensive.

These three theories of capital structure lead us to formulate four explicit hypotheses. Testing these hypotheses forms the focus of our empirical analysis. We find, first of all, that trade liberalization does appear to have a significant effect on profitability. Declining import tariffs are associated with falling profits as firms are subject to increasing import competition. This effect is strongest for the firms with the highest levels of important competition. Declining export tariffs tend to increase profits and this effect is strongest for most firms in the export-oriented industries.

Trade liberalization also affects leverage. Our findings are consistent with the pecking order model of capital structure. Falling Canadian tariffs are associated with increasing leverage while reduced U.S. tariffs are associated with decreasing leverage. We conclude that our evidence suggests that the pecking order effect is more important than the tax advantage–bankruptcy cost trade-off as an explanation of leverage. Our data do not permit precise testing of the market timing theory. However, we do check to see if leverage structure is sensitive to annual interest rate changes. This is a crude test and we find no significant effect.

Most previous work linking financial leverage and product markets has emphasized the dependence of competition in the product market on the firm's choice of financing. Our work suggests a reciprocal effect. By altering both competition at home and access to markets in foreign countries, trade liberalization has significant implications for the financial structure of firms. These findings are relevant for the analysis of international trade policy and of corporate finance. More specifically, understanding the interaction between trade policy and financial structure at the firm level is important to enhance our appreciation of the broad and varying implications of increasing trade liberalization as well as the financing choices of firms.

Data appendix

The T2-LEAP data set is created by linking the Longitudinal Employment Analysis Project (LEAP) with the Corporate Tax Statistical Universe File (T2SUF). Firms enter the LEAP data base in the year they first hire employees, and record their last entry in the data base in the last year they hire employees. Annual employment for each firm is measured in average labour units (ALU). The reported ALU can be interpreted as the number of "standardized employees" working for a firm during that year. A standardized employee corresponds to the industry-specific average (based on payroll data) across full-time and part-time workers. For example, in an industry where half the workers were half-time and half were full-time, a "standardized" worker would be a 75% time worker. Therefore, a firm that had three full-time workers all paid the industry average wage would have four "standardized" workers.

The T2SUF tracks every incorporated firm in Canada filing a T2 form with the Canada Revenue Agency (CRA). Thus the T2-LEAP data set contains every firm in Canada that is both incorporated and hires employees. We limit our sample to firms with more than one employee. This removes the very smallest firms and a lot of "noise" from the data. The eliminated firms are significant in number but negligible in economic importance and many are fictional entities created entirely for tax purposes.

A second filter relates to leverage. We measure leverage as the debt to asset ratio. Firms report assets, debt, and equity. CRA reporting imposes the constraint that the sum of debt plus equity equals assets. The normal procedure is that firms determine a book value of assets and a book value of debt according to tax law and generally accepted accounting principles (GAAP). They then calculate equity as the difference between assets and debt. Assets almost always (i.e., in about 97% of cases) exceed debt, and the leverage ratio is therefore almost always between 0 and 1. However, firms can have debts that exceed the book value of assets, implying negative equity. Most cases of negative equity reflect a measurement problem. A firm might be able to borrow money on the basis of a business plan or business idea that is not reported as an asset even though it is an economic asset from a conceptual point of view. Debt could then exceed reported assets, and the leverage ratio could exceed 1, even though the "true" debt to asset ratio would be less than 1. In fact, a few firms report no assets and positive debt, leading to infinite leverage ratios. Even if we drop the infinite leverage ratios, we are still left with some finite but absurdly large ratios that would be influential (and misleading) outliers in any regressions. Accordingly, we eliminate all observations for which the debt to asset ratio exceeds 2. This filter eliminates observations whose values consist primarily of measurement error.

T2-LEAP contains firm information for 15 years, from 1984 to1998. However, the first and last years are subject to partial reporting, leaving the usable portion as 1985 to 1997. We use observations from 1989 forward, and use earlier data when necessary in constructing lags. For each firm, we discard the first and last year of its life in T2-LEAP as the first and last years will typically be partial years and can therefore produce misleading information. As we use first differences for some variables, we need two full calendar years of data for a given observation. For example, the firms appearing in our sample for 1989 are those which became incorporated and hired one or more employees on or before December 31, 1987, which did not exit the market before 1990.

The data set includes Canadian subsidiaries of foreign corporations. A large majority of firms either have purely Canadian ownership or widely dispersed ownership. The share of Canadian manufacturing assets controlled by wholly-owned or partially-owned subsidiaries of American firms is fairly large (approximately 26%) but this ownership is concentrated in large firms (GM Canada, Ford Canada, etc.) Arguably, foreign subsidiaries might have different pressures on their capital structure choices than independent firms. However, we believe that subsidiaries will, in general, be subject to the same incentives as other firms in making capital structure decisions and that any deviations would have no systematic effect that would bias our analysis.

In the case of firms that underwent mergers, acquisitions or spin offs during the sample period, the T2-LEAP record is defined by retrospective reconstruction. This means that if, for example, firm A merged with firm B in year *t*, then a new firm, C, is created and given a synthetic history aggregated from the histories of firms A and B. The individual histories of A and B disappear from the data base and firm C represents their joint operations.

Using 3-digit SIC codes, we are able to match both Canadian and U.S. tariff rates to each firm by year and industry as in Head and Ries (1999). U.S. tariffs are compiled using the 93 industry classification provided in Table A2.1 of the Canada-US Free Trade Agreement: An Economic Assessment (Government of Canada, Department of Finance, 1988). Canadian tariffs are compiled from Lester and Morehen (1987). See Head and Ries (1999) for further details.

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